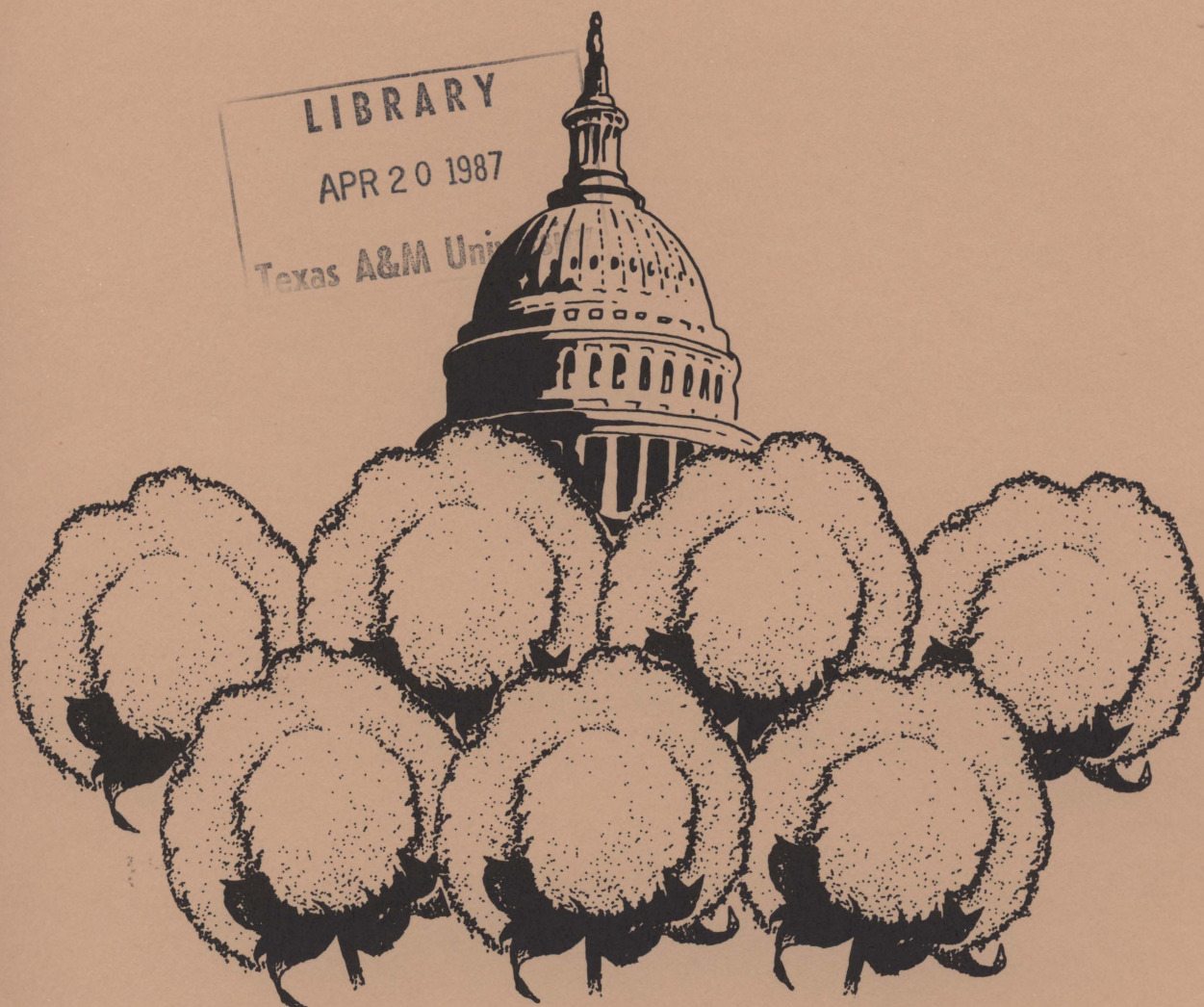


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Impacts of Farm Policies and Technology on the Economic Viability of Texas Southern High Plains Cotton Farms



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IMPACTS OF FARM POLICIES AND TECHNOLOGY ON THE ECONOMIC VIABILITY OF TEXAS SOUTHERN HIGH PLAINS COTTON FARMS

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Impacts of Farm Policies and Technology on the Economic Viability of Texas Southern High Plains Cotton Farms

Executive Summary

The purpose of this study was to estimate the impacts of alternative government policies and technology on the growth and economic viability of representative cotton farms in the Texas Southern High Plains. The farms initially operated 1,088, 3,383, and 5,570 acres, had debt to asset ratios typical of farms in the area, owned the necessary machinery complement, and farmed both owned and leased acreage.

The results indicate that under the most likely technology scenario and continuation of the provisions of the 1981 Farm Bill, all three farms will have a high probability of remaining solvent through 1992. All three farms will have an 88% or greater chance of receiving a 3% or greater return to equity and will be able to grow over the 10-year planning horizon. The greatest percentage increase in ending farm size was for the 1,088-acre farm, followed by the 3,383-acre farm, and the 5,570-acre farm.

Imposing an acreage reduction program (acreage diversion and set aside) increased net farm incomes and average net present value for all three farms. Acreage reduction programs increased the annual rate of growth more for the 1,088-acre farm than for the two larger farms.

Removing the deficiency payment program (income supports) reduced the probability of survival, net farm incomes, and annual growth rates for all three farms. Removing both price supports (Commodity Credit Corporation loan) and deficiency payments reduced the probability of survival the most for the 1,088-acre farm (36 percentage points) while the probability of survival for the 5,570-acre farm was reduced by only 2 percentage points. Removing all farm program provisions reduced the probability of survival for all three farms. The probability of survival declined from 92% to 42% for the 1,088-acre farm, and from 90% to 62% for the 3,383-acre farm. The probability of survival for the 5,570-acre farm remained above 75%.

Imposing a more restrictive set of federal income tax provisions on the three representative farms caused a greater reduction of the average annual rate of growth for the two larger farms than for the 1,088-acre farm. Net farm incomes were also reduced to a greater extent for the larger farms than for the 1,088-acre farm. Growth occurred from leasing cropland as higher taxes reduced available cash for down payments.

Yield enhancing technology anticipated over the next 10 years for cotton did not significantly change the average annual growth rates of the representative farms. Changing the farm program or federal income tax provisions had a greater impact on farm growth than yield enhancing technology.

The results of analyzing the three farms reveal that the debt restructuring strategies evaluated here would not greatly benefit these farms. A two-year interest subsidy provided greater benefits to net present value, net farm income, and ending net worth than a debt restructuring program.

The results of this study indicate that moderate-size (1,088 acre) cotton farms in the Texas Southern High Plains are more dependent upon farm program provisions than larger farms for their continued growth and economic viability. *Larger farms are better able to survive without farm program benefits because of lower production costs (\$/lb.), higher average cotton lint prices, and a greater asset base from which to meet cash flow deficits.* Farms of all sizes are negatively impacted by the loss of any farm program provisions.

Impacts of Farm Policies and Technology on the Economic Viability of Texas Southern High Plains Cotton Farms

The economic impacts of farm policy, income tax provisions, and technology have not been clearly linked to changes in farm structure (Gardner). Numerous economists have suggested that farm programs have accelerated the growth of large scale farms while other economists suggest that the link between government programs and increased farm size has never been proven (Quance and Tweeten; Gardner; Gardner and Pope).

The purpose of this study is to analyze the impacts of selected farm programs, federal income tax provisions, and technology on the viability of three different size cotton farms in the Texas Southern High Plains.

Methodology

The first step was to describe three different size representative cotton farms in the study area. The second step involved a simulation of the representative farms using a Monte Carlo, whole-farm simulation model (FLIPSIM V) under alternative farm policy, income tax, finance, and technology scenarios.

Representative Farms

In 1980, Smith conducted a survey of farmers, bankers, input suppliers, cotton gins, and marketing firms in the Texas Southern High Plains. The survey provided the data necessary to describe representative farms for eight different size categories. Within each size category, the farms represented the average characteristics of farms in the region, including volume of cotton produced, cultural practices, machinery complements, financial position, input costs, and marketing strategies. For the present study, three of Smith's representative farms were updated for 1982 costs and prices. The three farms selected for this study represent a typical size farm in the region (1,088 acres); a large-scale farm (3,383 acres); and a very large-scale farm (5,570 acres). These farms were selected because they typify the scale of commercial agriculture, accounting for 31% of the farms and 62% of the cotton lint produced in the Texas Southern High Plains in 1980.

Table 1 provides a summary of the demographic and financial characteristics for the three representative cotton farms used in this study. The proportion of cropland owned is greater for the larger farms, ranging from 35% for the smallest farm to 62% for the largest farm. The market value of machinery for each farm reflects the 1982 market value of the typical machinery complement for these size farms.

The long- and intermediate-term debt to asset ratios for the 1,088-acre farm were obtained from USDA's 1979 Agricultural Finance Survey. These debt ratios are the average for part-owner cotton farmers in the Texas High Plains who had real estate debts in 1979. The 1979 Agricultural Finance Survey did not provide information for farms in the two larger size categories so the ratios reported by Smith were used. Smith's financial ratios for the 1,088-acre farm were similar to those reported in the Agricultural Finance Survey.

Beginning financial positions of representative farms in each of the three size categories (Table 1) were used rather than hypothetically assigning a common financial position. Using

TABLE 1. FINANCIAL CHARACTERISTICS OF THREE REPRESENTATIVE COTTON FARMS BY SIZE IN THE TEXAS SOUTHERN HIGH PLAINS

Characteristics	Farm Size (acres)		
	1,088	3,383	5,570
Age of operator	42	45	51
Acres owned	381	1048	3453
Acres leased	707	2335	2117
Value of owned cropland (\$1,000)	222.4	611.7	2,015.4
Value of machinery (\$1,000)	144.5	420.8	713.9
Value of off-farm investments (\$1,000)	59.0	110.0	213.7
Beginning cash reserve (\$1,000)	16.7	52.0	85.5
Long-term debt (\$1,000)	61.1	120.9	488.7
Intermediate-term debt (\$1,000)	98.3	203.6	475.4
Initial net worth (\$1,000)	275.0	854.8	2,032.3
Equity ratio (fraction) ^a	0.62	0.72	0.67
Leverage ratio (fraction) ^b	0.61	0.40	0.49
Long-term debt/asset (fraction)	0.27	0.20	0.24
Intermediate term debt/asset (fraction)	0.68	0.48	0.67
Off-farm income (\$1,000)	16.0	0.0	0.0
Minimum family living expenses (\$1,000)	15.2	29.1	38.0
Maximum family living expenses (\$1,000)	50.0	50.0	60.0

^aEquity ratio is total net worth by total assets.

^bLeverage ratio is the ratio of total debt to total net worth.

Source: Smith.

representative financial data required the model to recognize the different risk bearing abilities of different size farm operations.

Smith's survey of farmers identified average annual off-farm income and minimum family living expenses by farm size (Table 1). These values for living expenses were used for the study. Maximum annual family living expenses were assumed to be \$50,000 to \$60,000 depending on farm size. The family would utilize 25 cents of every additional dollar of disposable income over and above the minimum requirement for family living. In no instance, however, will family living withdrawals exceed the maximum indicated in Table 1.

Cotton production costs for the three farms were estimated by updating Smith's 1980 production costs to reflect 1982 prices. The two larger farms had a 13% lower total cost per pound of cotton lint produced than the 1,088-acre farm. The 1982 annual production costs for irrigated and dryland cotton on the three representative farms assume the same proportional economies in input procurement reported by Smith. The mix of irrigated and nonirrigated cotton varied by farm size. The 1,088-acre farm irrigated 32% of its available cotton acreage while the two larger farms irrigated only 23%. In the simulation analysis, as the 1,088-acre farm grew in size, its proportion of irrigated cropland was decreased to 23%.

Simulation Model

The General Firm Level Policy Simulator -- FLIPSIM V (Richardson and Nixon) was used to simulate the three representative farms for selected policy and technology scenarios. The model is capable of simulating the annual functions of a crop farm (i.e., production, marketing, financial growth and decay, machinery depreciation and replacement, family consumption, incurring fixed and variable costs, and participating in farm programs).

Each representative farm was simulated over the 10-year planning horizon beginning in 1983 and extending through 1992. The planning horizon was then repeated 50 times using a different set of random cotton prices and yields for each iteration. At the end of each iteration, values for key output variables were calculated.

The model begins each year of the planning horizon by determining the production costs for the current size of the farm based on production costs provided for larger farms. The representative farms were permitted to grow over time so cropland and per acre production costs were forced to change to correspond to larger representative farms.

After determining the relevant cropland and costs for the farm the model selects the random crop prices and yields for that year. Random yields for irrigated and nonirrigated cotton and random prices for cotton lint and cottonseed were drawn to reflect the historical variability typical of the study area (Table 2).

FLIPSIM V simulates variable production costs for each crop by multiplying the per acre input costs by planted acreages for the respective crops. Labor costs are calculated as the sum of full-time labor charges plus the cost of part-time labor. Part-time labor needs are based on the difference between hours of monthly labor available from full time employees and non-paid family members and the monthly labor needs for all crops. Harvesting costs are the product of the per unit harvest costs, random yield, and harvested acreage. Each farm's initial production and harvesting costs were expressed in 1982 dollars.

Annual crop yields are selected at random based on the historical yield variability observed for the study area (Table 2) subject to the technology scenario being evaluated, the year of the

TABLE 2. ANNUAL YIELDS AND PRICES FOR TYPICAL COTTON FARMS IN THE TEXAS SOUTHERN HIGH PLAINS, 1974-1983

Year	Irrigated Cotton lint ^a (lbs/acre)	Nonirrigated Cotton lint (lbs/acre)	Cotton lint Price ^b (\$/lb)	Cottonseed Price ^c (\$/ton)
1974	341	83	0.4850	124.0
1975	212	336	0.4756	88.8
1976	553	397	0.6465	100.0
1977	552	355	0.4236	62.0
1978	471	130	0.5566	117.0
1979	369	331	0.5859	120.0
1980	215	65	0.7465	121.0
1981	419	313	0.4540	90.0
1982	0 ^d	0 ^d	0.4955	95.0
1983	410	276	0.6135	85.0
Means	410	189	0.58	110.3

^aCottonseed yield is a linear function of lint yield, averaging about 0.4 tons per bale (480 lbs) of lint.

^bCotton lint prices are average cash prices quoted for 41-30 (graded-staple) cotton in Lubbock for the second week of December in each year.

^cCottonseed prices are season average prices for Lubbock, Texas (December-February quotes).

^dA hailstorm over most of the Southern High Plains reduced yields to zero for both irrigated and dryland cotton.

planning horizon, and the size of farm. Under the base technology scenario, the 5,570-acre farm would adopt the new technology during years 1 to 3. The 3,383-acre farm was assumed to adopt this technology in a similar pattern during years 4 to 6 and the 1,088-acre farm would make the adoption in years 7 to 9. Prior to adoption, mean yields were set equal to historical averages in Table 2. After full adoption mean yields were held constant at 105% of their historical means.

The model calculates property taxes based on the market value of land and the property tax rate for the study area. Other fixed costs are determined by the analyst. The model amortizes all outstanding loans assuming they are simple interest mortgages. Annual interest rates for existing debt on land, machinery, and operating loans were 8.5, 13.4, and 14.4%, respectively. Annual interest rates for new debts and refinanced loans on long- and intermediate-term assets were 11.4 and 13.4%, respectively. Cash reserves and off-farm investments were allowed to earn 10% interest annually. The market value of farm machinery was updated assuming the real market value of used equipment decreased 1% per year. The market value of cropland was estimated using the historical relationship between the capital gains rate for cropland and the rate of returns for farms.¹

The model next depreciates each piece of equipment on the farm for income tax purposes. Equipment purchased prior to 1981 was depreciated using the double declining balance method and a 5- to 7-year life. Equipment placed into use after 1980 was cost recovered assuming a 5-year life and the Accelerated Cost Recovery System (ACRS) rules. Regular purpose and special purpose buildings were depreciated using ACRS rules or the double declining balance method when applicable. Equipment that has passed its economic life (7 to 10 years) was replaced by trading the existing piece for a replacement, if sufficient cash was available to cover the required downpayment. The cost of replacement equipment expressed in 1982 dollars was held constant throughout the planning horizon. First year expensing and maximum investment tax credit were calculated for all equipment purchases.

The fraction of cotton marketed in the current tax year was estimated internally based on the operator's desired taxable income (\$7,400), estimated cash receipts, and income tax deductions.² If the market price is less than the effective loan rate, the crop is placed in the Commodity Credit Corporation loan when available, rather than being sold. Stocks are released from the loan if the

¹ The annual capital gain rate for cropland (cgrate) is calculated as a function of the lagged capital gain rate and the real rate of return to production assets (rret) in the previous period:

$$\begin{array}{ccccccc} \text{cgrate} = & -0.0559 + & 0.0582 \text{ Dummy} + & 0.3673 \text{ cgrate}_{t-1} + & 2.490 \text{ rret}_{t-1} \\ & (-1.37) & (1.76) & (1.73) & (3.46) \end{array}$$

The Dummy variable is one for 1979 and 1980 and zero otherwise. The student-t ratios are below their respective coefficients. The R square for this equation was 68.6% and the F ratio was 6.55. The coefficients were estimated using national capital gain rates for farmland, 1970-1983 (USDA, *Farm Real Estate Market Developments*) and national residual returns to farm assets as a percent of total assets (pages 105-106, USDA, *Economic Indicators*).

² Income tax consequences frequently determine the fraction of crops sold during the income tax year they are harvested. The first step in calculating this fraction is to determine the operator's expected income tax deductions and cash receipts. Estimated deductions include: fixed costs, interest payments, variable production and harvesting costs, labor costs, cash rent for land, depreciation, crop insurance premiums, and personal income deductions (\$1,000 per dependent plus excess itemized deductions). Estimated cash receipts include: value of all crops if sold in the current tax year; value of crops held over from the previous year and sold in the current year; all off-farm income; and other farm income. If estimated cash receipts are less than estimated tax deductions plus the targeted taxable income (\$7,400), all crop production is sold in the current tax year. When cash receipts exceed deductions plus \$7,400, the proportion of crops sold in the next tax year equals the percentage of the crop that must be carried over for current cash receipts to equal deductions plus \$7,400.

market price in the following year exceeds the loan rate plus interest. Deficiency payments are paid if the season average price is less than the target price.³ The deficiency payment is a function of the payment rate, farm program yield, and harvested acreage. When an acreage set aside or diversion program is simulated, the model reduces planted acreage the specified amount and accounts for increases in production on the more productive land left in production (i.e., slippage).

After simulating the farm policies specified by the user, the model determines the farm operator's year-end financial position, calculates family cash withdrawals,⁴ and calculates income taxes payable in the following year. Cash surpluses are deposited in an interest bearing account at 10% interest. Year-end cash flow deficits are handled in the following order: (a) grant a lien on crops in storage at the operating loan interest rate, (b) refinance long-term equity, (c) refinance intermediate-term equity, and/or (d) sell cropland. If the operator is unable to cover the deficit in any one of these ways, the farm is declared insolvent and the model proceeds to the next iteration after calculating the operator's accrued income and self-employment taxes.

Personal income taxes and self-employment taxes are calculated assuming the operator is married, filing a joint income tax return, and itemizing personal deductions.⁵ The regular income tax liability is computed using two methods: (a) income averaging (if qualified), and (b) the standard tax tables. The model selected the tax strategy which resulted in the lower income tax liability.⁶

The farm is permitted to grow at the end of each year by purchasing cropland if the operator had cash available (after meeting all expenses) to cover a 30% downpayment for land and a 35% downpayment for any additional machinery necessary for the proposed larger farm. The operator is permitted to borrow against equity in land to meet up to 50% of the downpayment for land. The farm operation can also grow by leasing land if the operator has sufficient cash available to cover the 35% downpayment requirement for purchasing additional machinery required to operate the larger size farm. If machinery is purchased because of growth, the machinery is depreciated, investment tax credit calculated, and the operator's income taxes recomputed.

³ The 1981 Farm Bill indicates deficiency payments for cotton shall be based on annual average prices received by farmers. Since weighted average annual prices received by farmers in the Lubbock area are not available for cotton, the model calculated deficiency payments for cotton using season average prices. Target prices and loan rates for cotton were scaled down 8.3 cents per pound to account for locational and quality differentials between Lubbock prices and national average cotton prices used to calculate deficiency payment rates. This adjustment forced the maximum deficiency payment rate to be equal to the value that one would have used for a national policy simulation model.

⁴ A linear family consumption function was assumed for farmers in the Texas Southern High Plains. The function assumed a minimum level of annual family living expenses was incurred regardless of the farm's financial condition. Beyond the minimum, the operator had a 0.25 marginal propensity to consume out of disposable income. The consumption function was bounded on the top side by a maximum level of annual family living expenses (Table 1).

⁵ Depreciation recapture, capital gains and losses, investment tax credit, and depreciation allowances are explicitly accounted for in calculating the sole proprietor's accrued income tax liability. If there is a net operating loss from prior years, taxable income in the current year is appropriately reduced. If there is a net operating loss in the current year, it is automatically carried forward. Net operating loss carryback is not permitted in the model.

⁶ All investment tax credit allowances were deducted from the regular tax liability and the result was compared to the income tax liability under the alternative minimum tax. The operator paid the excess of the alternative minimum tax over the sum of the regular income tax liability and the regular minimum tax. Income tax rate schedules for 1983 and 1984 were included in the model, as well as a procedure to develop tax rate schedules for 1985-1990 based on changes in the Consumer Price Index.

After checking the farm's prospects for growth, the model updates the farm operator's balance sheet, cash flow statement, and prepares to simulate the next year of the planning horizon. The steps in the simulation process described above are repeated for 10 years or until the farm is declared insolvent, whichever comes first. After completing each iteration, the model summarizes the information for numerous key output variables and returns the farm to its initial economic situation (year one). This insures that the farm faces the same economic, policy, and physical relationships for each of 50 iterations analyzed.

Policy and Technology Scenarios

The three representative cotton farms were simulated for 10 years under the alternative scenarios described below. Seven farm policy scenarios (including a continuation of the 1981 Farm Bill), one income tax provision scenario, three financial bailout scenarios, and three alternative technology scenarios were simulated for each farm. These policies represent the current farm program and alternative policies which remove some or all program provisions that are thought to affect farm growth and viability. All policy values associated with each scenario were held constant across farm sizes to allow direct comparison of their impacts on different size farms. Each scenario is described in detail in this section of the report.

Farm Policy Scenarios

1. Base Policy -- The Base Policy Scenario involves continuation of the 1981 Farm Bill through 1992 and continuation of the income tax provisions under the 1982 Tax Act through 1992. Based on expected adoption of new technology, annual mean crop yields were assumed to increase as indicated in the previous section. For this scenario, it is assumed the following farm policies were in effect:

- Commodity Credit Corporation loan program is available to producers.
- An acreage diversion/set aside program in effect for 1983 to 1985, was utilized, excluding PIK. No acreage diversion/set aside program was in effect for 1986 to 1992.
- A target price-deficiency payment program is available for cotton in all years.
- The \$50,000 payment limitation for deficiency and diversion payments is in effect.
- Farms of all sizes are eligible to participate in these farm program provisions.

Values for loan rates, target prices, diversion rates, and diversion payment rates for 1983, 1984, and 1985 were set at their actual values. Loan rates and target prices for 1986 through 1992 were held constant at their 1985 levels. Annual loan rates and target prices for Texas cotton used in the analysis are summarized in Table 3 for 1983 to 1992. Historical farm policy parameters for the Texas cotton farms are outlined in Table 4. The average relationship between loan rates and prices for 1977 to 1982 was used to determine the average annual prices for cotton lint in 1983 to 1992. (This was done to minimize any bias caused by setting mean prices too close to either the loan rate or the target price.)

The following options for depreciating machinery and calculating income taxes were used for the Base scenario:

TABLE 3. LOCALIZED LOAN RATES AND TARGET PRICES FOR A REPRESENTATIVE COTTON FARM IN THE TEXAS SOUTHERN HIGH PLAINS, 1983 TO 1992 ^a

Years	Loan Rates Cotton Lint (\$/lb)	Target Price Cotton Lint (\$/lb)
1983	0.47	0.66
1984	0.46	0.69
1985	0.45	0.68
1986	0.45	0.68
1987	0.45	0.68
1988	0.45	0.68
1989	0.45	0.68
1990	0.45	0.68
1991	0.45	0.68
1992	0.45	0.68

^aLoan rates and target prices in effect for 1983 to 1984 and announced for 1984 were localized based on the 1983 to 84 discount for the typical grade of cotton marketed in Lubbock, Texas in 1982 to 1983.

TABLE 4. NATIONAL LOAN RATES AND TARGET PRICES FOR COTTON AND ACREAGE SET ASIDE/DIVERSION RATES, 1977 TO 1985

Year	Loan Rate (\$/lb)	Target Price (\$/lb)	Set Aside Rate (%)	Diversion (%)	Diversion Payment Rate (\$/lb)
1977	0.4463	0.4780	0.00	0.00	
1978	0.4800	0.5200	0.00	0.00	
1979	0.5023	0.5770	0.00	0.00	
1980	0.4800	0.5840	0.00	0.00	0.00
1981	0.5246	0.7087	0.00	0.00	0.00
1982	0.5708	0.7100	0.15	0.00	0.00
1983	0.5500	0.7600	0.20	0.05	0.25
1984	0.5500	0.8100	0.25	0.00	0.00
1985	0.5500	0.8100	0.20	0.05	0.25

Source: U.S. Department of Agriculture. *ASCS Commodity Fact Sheet: Upland Cotton*. May 1983.

- Machinery and buildings placed in use prior to 1981 are depreciated using the double declining balance method.
- Machinery and buildings placed in use after 1980 are depreciated using an accelerated cost recovery method.
- The operator elects to claim first year expensing for all depreciable items.
- The operator elects to take maximum investment tax credit (ITC) and reduce the basis.
- The operator adjusts crop sales across tax years to reduce current year taxes.
- The operator may use either the regular income tax computation or income averaging to calculate federal income tax liabilities.
- There is no maximum interest deduction for calculating taxable income.
- The actual self employment tax rates and maximum income levels subject to this tax for 1983 and 1984 are used. Announced values for these variables in 1985 to 1986 were used and the 1986 values were held constant through 1992.
- The operator elects to trade in old machinery on new replacements at the end of each item's economic life.

2. *A 20% Acreage Reduction* -- The provisions of the Base Policy Scenario were modified by adding a 15% set aside with a 5% paid diversion for cotton in 1986 to 1992. Reasonable slippage (70% for cotton) and program participation rates were used to estimate the resulting increase in mean prices in 1986 to 1992.⁷ All other provisions of the Base Scenario were used without change.

3. *No Farm Program Payment Limitation* -- All provisions of the Base Scenario were used except no limitation was placed on diversion and deficiency payments.

4. *No Price Supports and No Deficiency Payments* -- The Commodity Credit Corporation loan and target price provisions under the Base Scenario were assumed to have been eliminated for all years in the planning horizon (1983 to 1992). Annual mean prices for cotton were decreased 2% based on the expected impact of removing the price and income support programs. Relative variability in prices about their means was increased based on the work of Morton, Devadoss, and Heady as to the effects of no farm program on U.S. agriculture.⁸ To isolate the impact of price and

⁷ The price response from a 15% acreage set-aside and 5% diversion was calculated assuming the own price flexibility for cotton was -1.75, slippage was 70%, and program participation was 80%. Based on these assumptions the price response would be about 8.4%, so the annual mean cotton prices in Table 3 were increased 8.4% in 1986-1992.

⁸ Morton, Devadoss, and Heady estimated the effect of removing all farm programs on corn and wheat. Their results suggest that the relative variability in the price of wheat and corn would increase 207% and 131%, respectively, and the mean prices for these crops would decline 1% and 8%. One would expect that removing price supports (Commodity Credit Corporation loan and FOR) would increase the variability of wheat price more than that of corn price because these price support mechanisms have influenced the season average price of wheat more than the corn price over the past decade. Increased relative variability in the price of cotton is assumed to increase 160% or the average of the increases reported for wheat and corn by Morton, Devadoss, and Heady. Cotton farmers have depended on the loan to establish a floor price less frequently than wheat farmers but more frequently than corn producers over the past decade. The expected change in the mean price of cotton due to removing the Commodity Credit Corporation loan is to decrease the mean price for Texas High Plains cotton farmers about 2%. This decrease was estimated by calculating the mean price of cotton in the Southern High Plains using the empirical distribution for cotton price in Table 3, both with and without the Commodity Credit Corporation loan.

income supports on the representative farms, the acreage diversion and set aside programs in the Base Policy for 1983 to 1985 were assumed to remain in effect.

5. *No Target Price/Deficiency Payment* -- The target price and deficiency payment provision was assumed to be eliminated for all years of the planning horizon (1983 to 1992). All other provisions of the Base Scenario were used without change to isolate the effects of removing only the deficiency payment.

6. *Target Farm Program Benefits* -- All farm program and income tax provisions of the Base Scenario were used, except that farms with more than \$300,000 of sales were not eligible to participate in farm program provisions. This program restriction excluded the 5,570-acre farm from participating directly in the program provisions (Commodity Credit Corporation loan, target price/deficiency payments, and set aside-diversions). Mean prices and relative variability in prices were not adjusted because sufficient "smaller" farms were assumed to participate in the farm program for the price support actions of the Commodity Credit Corporation loan to function normally.

7. *No Farm Program* -- All farm program provisions outlined for the Base Scenario were eliminated for all 10 years of the planning horizon. Mean annual prices and relative variance in prices for the No Price and Income Supports Scenario (4) were used due to eliminating provisions of the Commodity Credit Corporation loan.

Income Tax Scenarios

8. *Reduced Income Tax Benefits and Base Farm Program* -- The federal income tax provisions in place for the Base Policy Scenario were made more restrictive. All farm policy provisions of the Base Scenario were left unchanged. The more restrictive federal income tax provisions included:

- Using the straight line cost recovery method to calculate depreciation on machinery and buildings.
- Eliminating first year expensing provisions for all depreciable items.
- Continuing investment tax credit (ITC) provisions but eliminating the maximum ITC provision.
- Setting the maximum annual interest expense which could be used to reduce taxable income at \$15,600. This value represents the annual interest expense deductions a consumer might have for a home, automobiles, etc.
- Making the operator sell obsolete machinery upon disposition rather than trading it in on new replacements, and thus forcing recapture of excess depreciation deductions.

All other federal income tax provisions for the Base Scenario were used as outlined earlier.

Financial Stress Scenarios

9. *Base Finance Scenario* -- Each farm's long-term debt to asset ratio was increased to 0.55 and its intermediate-term debt to asset ratio was increased to 0.60 to represent a highly leveraged farm. Annual long- and intermediate-term interest rates were increased to their average values for 1980 to 1983 (.1139 and .1343, respectively) to represent a farm which had been forced to refinance

its assets during the past 4 years. The farm program provisions associated with the Base Policy Scenario (1) were continued for this scenario.

10. Debt Restructure -- The length of intermediate-term loans was increased by 1 year, and a portion of intermediate debt was converted to long-term debt. The conversion of intermediate-term debt was permitted if the long-term debt to asset ratio did not exceed 0.65. For some farms, this allowed all intermediate-term debt to be converted to long-term debt. For other farms, this constraint substantially restricted debt conversion. Total debt loads and farm program provisions were the same as those used for the Base Finance Scenario (9).

11. Interest Subsidy -- The annual interest rates, debt levels, and farm program provisions in the Base Finance Scenario (9) were simulated but an interest subsidy was provided during the first 2 years. The interest subsidy took the form of an interest rate reduction equal to 3.4 percentage points for long-term interest rates and 5.4 percentage points for intermediate-term interest rates. These interest rate reductions were the amounts necessary to reduce the respective interest rates (.1137 and .1343) to 4%.

No New Technology Scenarios

12. No New Technology and Base Farm Policy -- The federal income tax and farm program provisions in the Base Policy Scenario (1) were simulated assuming no increase in mean yields over the planning horizon. For the No New Technology Scenarios, mean irrigated and dryland cotton yields for all 10 years were set equal to their respective means observed over the period 1974 to 1983 (Table 2).

13. No New Technology and No Deficiency Payments -- The farm program provisions in the No Target Price/Deficiency Payments Scenario (5) were simulated assuming the same average annual cotton yields used for the base No New Technology Scenario (12).

14. No New Technology and No Farm Program -- All farm program provisions were eliminated (Scenario 7) and annual average crop yields used for the base No New Technology Scenario (12) were assumed.

Evaluation Criterion

The FLIPSIM V model provides considerable detail about the viability of a representative farm at the end of each iteration, e.g., ending leverage ratio, ending net worth, ending farm size, total assets, total debt, net present value, and whether the farm remained solvent for 10 years. By repeating each scenario for 50 iterations, the model generates the information necessary to estimate mean values for key output variables. The means of these key output values are used to compare the economic impacts of selected policy and technology scenarios on representative farms. The following output variables for the model were selected to compare the impacts of the scenarios described in the previous section.

- *Probability of survival* is defined as the probability that the representative farm will remain solvent for 10 years. In other words, it is the probability that the operator would maintain the minimum financial ratios required by local bankers for all years of the planning horizon (debt to asset ratio less than 0.70).
- *Probability of a positive net present value* is the probability that the representative farm will

have a positive after-tax net present value. An after-tax, real discount rate of 3% was used to calculate the farm's net present value. Thus this statistic indicates the probability of the representative farm providing at least a 3% real rate of return to the operator's initial net worth.

- *After-tax net present value (NPV)* is the present value of the operator's annual cash withdrawals (CW) plus the present value of the change in net worth (NW) minus the present value of annual off-farm income (OY):

$$NPV = \sum_{t=1}^T \frac{CW_t - OY_t}{(1.03)^t} + \frac{NW_T}{(1.03)^T} - NW_0$$

Cash withdrawals equal family living expenses plus state and federal income taxes and self-employment taxes. Initial net worth (NW_0) and ending net worth (NW_T) explicitly consider the value of off-farm investments and accrued taxes. A 3% after-tax, real discount rate was used to calculate net present value for all representative farms.

- *Present value of ending net worth* is used to indicate the change in the farm's real net worth over the planning horizon. Net worth is affected by increases (or decreases) in asset (land, machinery, and livestock) value and retained earnings. This value can be compared directly to initial net worth to indicate the relative magnitude of real financial growth.
- *Acres owned, leased, and controlled* at the end of the planning horizon for each iteration indicate the impacts of alternative scenarios on the rate of growth for representative farms. These three statistics provide an indication of how the farm grew either by purchasing or leasing land.
- *Total long- and intermediate-term debts* at the end of the planning horizon provide an insight into the financial stress of the farm over the planning horizon. Increases in average ending debt from one scenario to another can be due to either rapid growth through purchasing land and machinery or the farm operator being forced to refinance large cash flow deficits. When surplus cash is available, the operator is permitted to first prepay intermediate-term debts and then prepay new long-term debts. Therefore large ending intermediate-term debts indicate insufficient cash was available to reduce intermediate-term debt through prepayment of principal.
- *Ending equity ratio* is the farm's ending ratio of total net worth to total assets. This ratio provides a "bottom-line" measure for comparing the representative farm's ending financial position across scenarios.
- *Average Annual Net Farm Income* is the average net farm income received by the operator over all years simulated. Net farm income equals total farm receipts plus total government payments minus all cash production expenses, interest payments, labor costs, fixed cash costs, and depreciation. This value excludes all non-farm income and interest earned on cash reserves.
- *Average Annual Government Payment* is the average annual government payment (deficiency and diversion payments) received over all years simulated.

TABLE 5. COMPARISON OF SELECTED POLICY SCENARIOS ON A REPRESENTATIVE 1088 ACRE TEXAS SOUTHERN HIGH PLAINS COTTON FARM

Criteria	Initial Situation	Alternative Scenarios ^a							
		1	2	3	4	5	6	7	8
Probability of survival (%)	--	92	94	94	56	68	92	42	88
Probability of positive net present value (%)	--	92	94	94	48	56	92	32	88
After-tax net present value mean (\$1,000)	--	381.3	473.6	427.9	-16.8	48.8	380.8	-95.2	364.4
Average present value of ending net worth (\$1,000)	275.0	563.9	648.3	600.9	241.8	300.9	563.7	167.1	516.0
Average ending cropland owned (acres)	381.0	598.4	665.3	681.6	372.1	403.6	598.4	283.6	579.1
Average ending cropland leased (acres)	707.0	960.0	969.9	966.4	843.9	870.0	960.0	929.2	985.7
Average ending cropland controlled (acres)	1088.0	1558.4	1635.2	1647.9	1216.0	1273.6	1558.4	1212.8	1564.8
Average ending long-term debts (\$1,000)	61.0	135.8	153.1	186.4	89.9	95.7	136.6	68.9	148.4
Average ending intermediate-term debts (\$1,000)	98.3	23.9	15.7	21.2	105.5	84.9	23.9	128.5	37.2
Average ending equity ratio (fraction)	0.62	0.75	0.77	0.74	0.46	0.57	0.71	0.28	0.70
Average internal rate of return (fraction)	--	0.08	0.10	0.09	-0.12	-0.03	0.08	-0.21	0.07
Average annual net farm income (\$1,000)	--	8.3	13.3	11.9	-28.9	-21.7	8.2	-40.6	-6.0
Average annual gov't payment (\$1,000)	--	26.0	22.2	29.5	1.3	1.1	25.9	0.0	25.8

^aThe scenarios are:

- 1 -- Base policy or continuation of the 1981 Farm Bill and 1983 federal income tax provisions.
- 2 -- A 20% acreage reduction in 1986-1992.
- 3 -- No farm program payment limitation in 1983-1992.
- 4 -- No price support and no deficiency payment in 1983-1992.
- 5 -- No target price/deficiency payment in 1983-1992.
- 6 -- Target farm program benefits to farms that produce less than \$300,000 in program crops.
- 7 -- No farm program in 1983-1992.
- 8 -- Reduced income tax benefits and the Base farm program.

TABLE 6. COMPARISON OF SELECTED POLICY SCENARIOS ON A REPRESENTATIVE 3383 ACRE TEXAS SOUTHERN HIGH PLAINS COTTON FARM

Criteria	Initial Situation	Alternative Scenarios ^a							
		1	2	3	4	5	6	7	8
Probability of survival (%)	--	90	94	94	72	82	86	62	88
Probability of positive net present value (%)	--	88	94	94	68	80	86	60	88
After-tax net present value mean (\$1,000)	--	960.6	1289.5	1540.5	375.6	535.6	680.5	217.4	945.3
Average present value of ending net worth (\$1,000)	854.8	1412.4	1696.8	1853.4	930.5	1054.5	1191.3	800.7	1225.7
Average ending cropland owned (acres)	1048.0	1813.9	1945.2	2095.6	1331.5	1455.4	1541.9	1275.6	1468.4
Average ending cropland leased (acres)	2335.0	2474.6	2509.8	2481.0	2416.3	2401.2	2442.6	2373.0	2497.0
Average ending cropland controlled (acres)	3383.0	4288.6	4455.0	4576.6	3747.8	3856.6	3984.6	3648.6	3965.4
Average ending long-term debts (\$1,000)	120.9	458.3	430.0	443.3	269.5	289.0	333.5	273.3	360.4
Average ending intermediate-term debts (\$1,000)	203.6	92.7	73.6	58.6	216.3	168.9	126.3	242.9	107.3
Average ending equity ratio (fraction)	0.72	0.69	0.75	0.75	0.60	0.65	0.69	0.52	0.67
Average internal rate of return (fraction)	--	0.07	0.11	0.12	0.00	0.05	0.05	-0.08	0.08
Average annual net farm income (\$1,000)	--	33.4	53.6	83.3	-14.8	3.6	12.9	-39.7	-7.2
Average annual gov't payments (\$1,000)	--	38.0	35.1	83.3	3.2	3.0	16.8	0.0	37.9

^aThe scenarios are:

- 1 -- Base policy or continuation of the 1981 Farm Bill and 1983 federal income tax provisions.
- 2 -- A 20% acreage reduction in 1986-1992.
- 3 -- No farm program payment limitation in 1983-1992.
- 4 -- No price support and no deficiency payment in 1983-1992.
- 5 -- No target price/deficiency payment in 1983-1992.
- 6 -- Target farm program benefits to farms that produce less than \$300,000 in program crops.
- 7 -- No farm program in 1983-1992.
- 8 -- Reduced income tax benefits and the Base farm program.

TABLE 7. COMPARISON OF SELECTED POLICY SCENARIOS ON A REPRESENTATIVE 5570 ACRE TEXAS SOUTHERN HIGH PLAINS COTTON FARM

Criteria	Initial Situation	Alternative Scenarios ^a							
		1	2	3	4	5	6	7	8
Probability of survival (%)	--	94	96	98	92	96	88	78	94
Probability of positive net present value (%)	--	90	94	98	70	84	76	66	84
After-tax net present value mean (\$1,000)	--	1595.2	2148.1	2905.5	811.4	1151.1	722.4	469.4	1574.4
Average present value of ending net worth (\$1,000)	2032.3	3027.3	3489.0	4046.7	2366.6	2645.4	2286.7	2066.4	2583.3
Average ending cropland owned (acres)	3453.0	3530.9	3716.7	4207.6	3086.0	3352.5	3064.5	3011.7	3317.9
Average ending cropland leased (acres)	2117.0	2471.1	2330.1	2306.4	2695.2	2495.9	2662.3	2724.6	2428.1
Average ending cropland controlled (acres)	5570.0	6001.9	6046.8	6514.0	5781.2	5848.4	5726.8	5736.3	5746.0
Average ending long-term debts (\$1,000)	488.7	519.4	425.6	477.4	542.2	545.6	540.5	559.3	790.1
Average intermediate-term debts (\$1,000)	475.4	112.6	107.1	60.0	190.7	146.9	207.7	271.5	152.1
Average ending equity ratio (fraction)	0.67	0.79	0.84	0.85	0.71	0.77	0.76	0.68	0.71
Average internal rate of return (fraction)	--	0.07	0.10	0.13	0.05	0.06	0.01	-0.06	0.08
Average annual net farm income (\$1,000)	--	66.6	100.6	170.6	-3.2	31.0	-13.9	-40.5	-15.6
Average annual gov't payments (\$1,000)	--	40.2	39.1	135.8	4.8	4.6	0.0	0.0	40.4

^aThe scenarios are:

- 1 -- Base policy or continuation of the 1981 Farm Bill and 1983 federal income tax provisions.
- 2 -- A 20% acreage reduction in 1986-1992.
- 3 -- No farm program payment limitation in 1983-1992.
- 4 -- No price support and no deficiency payment in 1983-1992.
- 5 -- No target price/deficiency payment in 1983-1992.
- 6 -- Target farm program benefits to farms that produce less than \$300,000 in program crops.
- 7 -- No farm program in 1983-1992.
- 8 -- Reduced income tax benefits and the Base farm program.

Results

The results of simulating Scenarios 1-8 for the three representative cotton farms are summarized in Tables 5 to 7. Under the Base Policy Scenario, all three farms had a 90% or greater chance of remaining solvent for 10 years and an 88% or greater chance of receiving a positive net present value. On the average, all three farms were able to increase their real net worth, and two of the farms increased their average ending equity ratio. In addition, all three farms were able to increase the average total number of acres they controlled. The 1,088-acre farm grew 470 acres (43%) over the 10 year planning horizon, while the 3,383- and 5,570-acre farms grew by 26.7% and 7.7%, respectively.

Acreage Reduction Program

Imposing a 20% acreage reduction program on the three cotton farms (Scenario 2) increased their probability of survival, their probability of experiencing a positive net present value, average net present value, and average ending farm size relative to results for the Base Scenario. These results are to be expected because an acreage reduction program increases mean cotton price and provides a small diversion payment to defray the costs of participating in the acreage reduction program. The increase in average ending farm size due to the 20% acreage reduction program ranges from 1% for the 5,570-acre farm to 4.9% for the 1,088-acre farm. Average annual government payments to all three farms are less than under the Base Scenario because higher mean cotton prices reduce deficiency payment rates and thus total government payments.

No Payment Limitation

Eliminating the \$50,000 payment limitation (Scenario 3) resulted in substantial increases in average annual government payments for the 5,570- and 3,383-acre farms while only marginally impacting the 1,088-acre farm. Average net present value for the 5,570-acre farm was increased 82% over the Base Scenario as a result of eliminating the payment limitation. In contrast, average net present value for the 1,088-acre farm was increased 12% by eliminating the \$50,000 limitation. Average ending farm size for the 5,570-acre farm was increased 8.5% over the Base by eliminating the payment limitation, while ending farm size for the 1,088-acre farm was increased 5.7%. The incentive exists for larger farms to restructure their operations to obtain maximum benefit of deficiency payments.

No Price and Income Supports

Removing both price and income supports (Scenario 4) reduced the probabilities of survival 2 percentage points for the 5,570-acre farm, 18 percentage points for the 3,383-acre farm, and 36 percentage points for the 1,088-acre farm. Average annual net farm income for the 1,088-acre farm declined from \$8,300 under the Base Policy Scenario to -\$28,300, and average net present value declined 104% to -\$16,800. Average net present value for the 5,570-acre farm was reduced about 50% to \$811,400. Average ending farm size for the 1,088-acre farm was 21.9% less than the Base Scenario, while the ending farm size for the 5,570-acre farm was only 3.6% less than the Base.

The loss of price and income supports increased the relative variability (risk) in net present value more for the 1,088-acre farm than the 5,570-acre farm. These results are to be expected when

price supports and deficiency payments are removed. Those farms with higher profit margins, greater equity, and higher mean yields should be better able to survive if price and income supports are removed.

No Income Supports

Removing the target price/deficiency payment (Scenario 5) reduced the probability of survival substantially more for the 1,088-acre farm than for the 5,570- and 3,383-acre farms. This result was not surprising given the finding under Scenario 3. An effective payment limit of \$50,000 sufficiently reduces the benefits derived from the target price/deficiency payment provisions for the larger farms. Therefore, the elimination of such a program would not be as detrimental. The loss in deficiency payments reduced average annual government payments \$25,000 for the 1,088-acre farm and \$35,400 for the largest farm. On a per-acre basis, this reduction in receipts was 343% greater for the small farm than the large farm thus, further explaining the significant differences in the results of this scenario for the two farms.

In the event that farm program provisions were targeted to farms producing \$300,000 or less in cotton (Scenario 4), only the 1,088-acre farm would be able to participate in the farm program during all years. The 3,383-acre farm would receive only 44% as great an average government payment as under the Base, due to such a program. In contrast, the 5,570-acre farm would not be able to participate directly in any farm program provisions if Scenario 4 were enacted. Probabilities of survival for the 3,383- and 5,570-acre farms fell to 86% and 88%, respectively. They did not fall to the low levels experienced under Scenario 4 when price and income supports were removed. Although these large farms could not benefit directly from price supports, they indirectly gain the benefits of reduced price variability due to other farmers participating in the loan program. This type of farm program would not reduce the rate of growth in farm size for the 1,088-acre farm; however, it would substantially reduce the rate of growth for the two larger farms.

No Farm Program

Removing all farm program provisions substantially reduced the probability of survival for all three farms (Scenario 7). The greatest reduction in the probability of survival was for the 1,088-acre farm and the least reduction was for the 5,570-acre farm. On the average, the 1,088-acre farm was forced to sell 100 acres to achieve a 42% chance of remaining solvent for 10 years. The 5,570-acre farm was able to remain solvent 78% of the time but only by selling an average of 440 acres over the planning horizon. Average annual net incomes for all three farms fell below zero, by about \$40,000, due to lower mean cotton prices, increased price variability, and the absence of deficiency payments. The only difference between this scenario and Scenario 4 (no price and income supports) was that Scenario 4 included a set aside and paid diversion from 1983 to 1985, with the associated price enhancement. Net present value, net worth, and probability of survival for all three farms were significantly benefitted by price enhancement and diversion payments from 1983 to 1985.

More Restrictive Income Taxes

Imposing a more restrictive set of federal income tax provisions (Scenario 8) reduced the probability of survival slightly more for the 1,088-acre farm than the 3,383-acre farm and had no effect on the 5,570-acre farm's chances for survival. Average net present value was reduced about

\$20,000 for all three farms. Average ending farm size was reduced from the Base about 7.5% for the 3,383-acre farm and about 4.3% for the 5,570-acre farm. As expected, increasing the federal income tax burden reduced the propensity of farms to grow through purchasing cropland in favor of growing through leasing. Total cropland controlled at the end of the planning horizon was about the same as the Base for the 1,088-acre farm, while ending farm size was 4 to 7% lower than the Base for the two larger farms.

Financial Bailout Strategies

To analyze the benefits of alternative financial bailout strategies, the financial positions for the three representative farms described in Table 1 were modified to emulate highly levered farms and simulated under the Base Policy scenario with alternative bailout strategies in place. The long-term debt to asset ratio for each farm was increased to 55%, the intermediate-term debt to asset ratios were set equal to 60%, annual interest rates were increased to their average values for 1980-1983 (11.37% for long term and 13.4% for intermediate term), and off-farm investments were set equal to zero. As a basis for comparison, these highly leveraged farms were simulated for 10 years using the farm policy and income tax provisions in the Base Policy Scenario (1). The results of simulating this Base Financial Scenario and the two financial bailout strategies are presented in Tables 8 to 10.

All three highly levered cotton farms have a low probability of remaining solvent for 10 years (56 to 66%) under the Base Policy Scenario (9). Restructuring debt (Scenario 10) for the three different size cotton farms did not appreciably improve their chances of survival. In fact, this type of financial assistance actually encouraged all three farms to grow through land purchases which resulted in lower probabilities of survival for two larger farms. On the other hand, an interest rate buydown program moderately increased the probability of survival for the two smaller (1,088 and 3,383 acre) farms and substantially increased the average net present value and ending net worth for all three.

An interest rate subsidy resulted in an increased average annual net farm income for all three farms, while the debt restructure actually reduced the average annual net farm income. Overall, the interest rate subsidy provided a greater benefit than the debt restructure bailout.

No New Technology

The simulation results presented thus far assumed the most likely technology scenario for the 10 year planning horizon. This amounted to a 5% increase in cotton yields being fully adopted in the first three years by the 5,570-acre farm, being adopted in years 4 to 6 for the 3,383-acre farm, and adopted in years 7 to 9 for the 1,088-acre farm. As a point of comparison, three of the policy scenarios were re-analyzed assuming no new technology was adopted by the three farms. The results of these no new technologies scenarios are summarized in Tables 11 to 13. To evaluate the impact of technology on the three farms, one must compare the results in Tables 11 to 13 to their respective results in Tables 5 to 7.

Due to its early adoption, the 5,570-acre farm benefited more from the new technology than the other two farms. The value of adopting the new technology early was evident in the added net present value for the 5,570-acre farm. Under the Base Scenario (1), the farm enjoyed a \$250,000 increase in average net present value due to early adoption of the new technology. In contrast, the 1,088-acre farm had a \$16,000 higher average net present value (under the Base Policy Scenario) due to the adoption of new technology.

TABLE 8. COMPARISON OF SELECTED FINANCIAL BAILOUT SCENARIOS FOR A REPRESENTATIVE 1,088-ACRE TEXAS SOUTHERN HIGH PLAINS COTTON FARM

Criteria	Initial Farm	Alternative Scenarios ^a		
		9	10	11
Probability of survival (%)	--	64	66	72
Probability of positive net present value (%)	--	64	66	72
After-tax net present value mean (\$1,000)	--	204.7	212.8	252.5
Average present value of ending net worth (\$1,000)	154.7	303.6	313.6	343.2
Average ending cropland owned (acres)	381.0	464.3	522.4	492.9
Average ending cropland leased (acres)	707.0	950.1	911.2	950.3
Average ending cropland controlled (acres)	1088.0	1414.4	1433.6	1443.2
Average ending long-term debts (\$1,000)	122.3	160.3	204.6	170.8
Average ending intermediate-term debts (\$1,000)	98.3	68.6	72.7	53.7
Average ending equity ratio (fraction)	0.40	0.40	0.37	0.51
Average internal rate of return (fraction)	--	0.00	0.04	0.07
Average annual net farm income (\$1,000)	--	-5.4	-6.4	1.3
Average annual gov't payments (\$1,000)	--	24.4	24.8	24.7

^a9 -- Base Finance Scenario consists of the Base farm program provisions for a highly leveraged farm.

10 -- Restructure debt for a highly leveraged farm.

11 -- Interest rate subsidy (buy-down) in the first two years for a highly leveraged farm.

TABLE 9. COMPARISON OF SELECTED FINANCIAL BAILOUT SCENARIOS FOR A REPRESENTATIVE 3,383-ACRE TEXAS SOUTHERN HIGH PLAINS COTTON FARM

Criteria	Initial Farm	Alternative Scenarios ^a		
		9	10	11
Probability of survival (%)	--	56	50	60
Probability of positive net present value (%)	--	56	52	60
After-tax net present value mean (\$1,000)	--	429.4	413.1	582.3
Average present value of ending net worth (\$1,000)	446.7	604.3	599.6	732.9
Average ending cropland owned (acres)	1048.0	1029.4	1180.4	1207.8
Average ending cropland leased (acres)	2335.0	2740.8	2660.2	2613.5
Average ending cropland controlled (acres)	3383.0	3770.2	3840.6	3821.4
Average ending long-term debts (\$1,000)	336.4	353.1	481.7	418.4
Average ending intermediate-term debts (\$1,000)	286.1	242.3	256.5	218.7
Average ending equity ratio (fraction)	0.41	0.28	0.40	0.35
Average internal rate of return (fraction)	--	0.00	0.01	0.04
Average annual net farm income (\$1,000)	--	-9.1	-21.2	6.9
Average annual gov't payments (\$1,000)	--	36.8	36.4	37.2

^a9 -- Base Finance Scenario consists of the Base farm program provisions for a highly leveraged farm.

10 -- Restructure debt for a highly leveraged farm.

11 -- Interest rate subsidy (buy-down) in the first two years for a highly leveraged farm.

TABLE 10. COMPARISON OF SELECTED FINANCIAL BAILOUT SCENARIOS FOR A REPRESENTATIVE 5,570-ACRE TEXAS SOUTHERN HIGH PLAINS COTTON FARM

Criteria	Initial Farm	Alternative Scenarios ^a		
		9	10	11
Probability of survival (%)	--	66	64	66
Probability of positive net present value (%)	--	62	60	64
After-tax net present value mean (\$1,000)	--	495.3	529.3	834.4
Average present value of ending net worth (\$1,000)	1195.9	1310.2	1356.3	1619.0
Average ending cropland owned (acres)	3453.0	2443.1	2651.7	2665.7
Average ending cropland leased (acres)	2117.0	3290.0	3324.7	3105.9
Average ending cropland controlled (acres)	5570.0	5733.2	5976.4	5771.6
Average ending long-term debts (\$1,000)	1108.5	830.3	1068.5	858.4
Average ending intermediate-term debts (\$1,000)	478.4	348.9	356.7	301.7
Average ending equity ratio (fraction)	0.42	0.41	0.46	0.44
Average internal rate of return (fraction)	--	0.09	0.10	0.13
Average annual net farm income (\$1,000)	--	-41.8	-57.3	-6.3
Average annual gov't payments (\$1,000)	--	41.1	41.3	41.6

^a9 -- Base Finance Scenario consists of the Base farm program provisions for a highly leveraged farm.

10 -- Restructure debt for a highly leveraged farm.

11 -- Interest rate subsidy (buy-down) in the first two years for a highly leveraged farm.

TABLE 11. COMPARISON OF SELECTED FARM POLICY SCENARIOS ASSUMING NO NEW TECHNOLOGY SCENARIO FOR A 1,088-ACRE TEXAS SOUTHERN HIGH PLAINS COTTON FARM

Criteria	Initial Farm	Alternative Scenarios ^a		
		12	13	14
Probability of survival (%)	--	92	68	42
Probability of positive net present value (%)	--	92	54	30
After-tax net present value mean (\$1,000)	--	365.4	37.3	-102.2
Average present value of ending net worth (\$1,000)	275.0	551.5	290.4	160.8
Average ending cropland owned (acres)	381.0	627.2	400.4	283.6
Average ending cropland leased (acres)	707.0	963.2	879.6	922.8
Average ending cropland controlled (acres)	1088.0	1590.4	1280.0	1206.4
Average ending long-term debts (\$1,000)	61.0	158.4	94.5	70.0
Average ending intermediate-term debts (\$1,000)	98.3	25.5	87.0	130.1
Average ending equity ratio (fraction)	0.62	0.73	0.56	0.26
Average internal rate of return (fraction)	--	0.08	-0.04	-0.17
Average annual net farm income (\$1,000)	--	7.0	-22.2	-41.0
Average annual gov't payments (\$1,000)	--	26.3	1.1	0.0

^a12 -- Base policy, continuation of 1981 Farm Bill, assuming most likely yields.

13 -- No target price/deficiency payments assuming most likely yields.

14 -- No farm program assuming most likely yields.

TABLE 12. COMPARISON OF SELECTED FARM POLICY SCENARIOS ASSUMING NO NEW TECHNOLOGY SCENARIO FOR A 3,383-ACRE TEXAS SOUTHERN HIGH PLAINS COTTON FARM

Criteria	Initial Farm	Alternative Scenarios ^a		
		12	13	14
Probability of survival (%)	--	88	78	60
Probability of positive net present value (%)	--	86	76	56
After-tax net present value mean (\$1,000)	--	860.0	432.3	146.4
Average present value of ending net worth (\$1,000)	854.8	1324.5	966.2	738.4
Average ending cropland owned (acres)	1048.0	1772.4	1423.4	1259.6
Average ending cropland leased (acres)	2335.0	2500.2	2394.8	2373.0
Average ending cropland controlled (acres)	3383.0	4272.6	3818.2	3632.6
Average ending long-term debts (\$1,000)	120.9	470.3	308.3	286.3
Average ending intermediate-term debts (\$1,000)	203.6	107.5	182.6	263.8
Average ending equity ratio (fraction)	0.72	0.67	0.62	0.48
Average internal rate of return (fraction)	--	0.07	0.03	-0.10
Average annual net farm income (\$1,000)	--	25.4	-3.6	-45.5
Average annual gov't payments (\$1,000)	--	37.9	3.0	0.0

^a12 -- Base policy, continuation of 1981 Farm Bill, assuming most likely yields.

13 -- No target price/deficiency payments assuming most likely yields.

14 -- No farm program assuming most likely yields.

TABLE 13. COMPARISON OF SELECTED FARM POLICY SCENARIOS ASSUMING NO NEW TECHNOLOGY SCENARIO FOR A 5,570-ACRE TEXAS SOUTHERN HIGH PLAINS COTTON FARM

Criteria	Initial Farm	Alternative Scenarios ^a		
		12	13	14
Probability of survival (%)	--	94	90	76
Probability of positive net present value (%)	--	86	74	60
After-tax net present value mean (\$1,000)	--	1340.8	780.8	210.8
Average present value of ending net worth (\$1,000)	2032.0	2806.5	2322.4	1842.6
Average ending cropland owned (acres)	3453.0	3487.1	3250.4	2988.2
Average ending cropland leased (acres)	2X17.0	2473.3	2566.0	2735.4
Average ending cropland controlled (acres)	5570.0	5960.4	5816.4	5723.6
Average ending long-term debts (\$1,000)	488.7	601.0	624.3	641.6
Average ending intermediate-term debts (\$1,000)	475.4	130.3	209.9	324.3
Average ending equity ratio (fraction)	0.67	0.80	0.71	0.81
Average internal rate of return (fraction)	--	0.08	0.04	-0.07
Average annual net farm income (\$1,000)	--	47.0	0.2	-65.9
Average annual gov't payments (\$1,000)	--	40.5	4.8	0.0

^a12 -- Base policy, continuation of 1981 Farm Bill, assuming most likely yields.

13 -- No target price/deficiency payments assuming most likely yields.

14 -- No farm program assuming most likely yields.

Despite the substantial contribution technology made to net present value for the 5,570-acre farm, average ending farm size was about the same (less than 50 acres greater) due to the early adoption of new technology. Similarly, for the two smaller farms, average ending farm size was almost identical for the two different levels of technology. These results suggest that farm programs have far more impact on a farm's economic viability and growth than moderate technological advancements in crop agriculture.

Summary of Results

Base Policy Scenario

- All three representative farms had a high probability of remaining solvent through the 10 year planning horizon.
- All three farms had greater than a reasonable (greater than 88%) chance of having a positive net present value.
- On the average, all three farms were able to grow by purchasing and leasing cropland.
- The largest percentage increase in ending farm size was for the 1,088-acre farm; however, the 3,383-acre farm had the greatest absolute increase in acres controlled.

Acreage Reduction Programs

- Average net present value was increased for all three farms as a result of an acreage reduction program.
- A 20% acreage reduction program increased average ending farm size about 1% for the 5,570-acre farm and about 5% for the 1,088-acre farm.
- Average ending equity to asset ratios for all three farms were increased 2 to 6 percentage points by a 20% acreage reduction program.
- Net farm income was increased more than 50% for the three Texas cotton farms.
- Deficiency payments were reduced from 3 to 15% for the three farms.

No Payment Limitation

- The larger the farm, the greater the impacts on growth and income from removing the \$50,000 payment limitation on deficiency and diversion payments. Average net present value increased 82% for the 5,570-acre farm, 60% for the 3,383-acre farm, and 12% for the 1,088-acre farm.
- Removing the payment limitation substantially increased the average ending farm size. On the average, the 5,570-acre farm grew 8.5% more than the Base, while the 3,383- and the 1,088-acre farms grew 6.7 and 5.7%, respectively.

No Price Supports and No Deficiency Payments

- Removing price and income supports for cotton reduced the probability of survival for all three farms. The probability of survival for the 1,088-acre farm declined the most.

- Average after-tax net present value was decreased 104% for the 1,088-acre farm and 50% to 60% for the two larger farms.
- The loss of price and income supports substantially reduced the rate of growth in farm size for the 1,088-acre farm (22%) while only moderately reducing the rate of growth for the largest farm (4%).
- Loss of price and income supports increased risk associated with income more for the 1,088-acre farm than for the larger farms.
- The presence of an effective \$50,000 payment limitation causes the income support program to benefit the 1,088-acre farm relatively more than larger farms. In contrast, the price support program results in a greater relative advantage for large and very large farms.

No Target Price/Deficiency Payment

- Removing the deficiency payment provision reduced the probability of survival considerably more for the 1,088-acre farm than for the 3,383- or 5,570-acre farms. The probability of survival declined from 94% to 68% for the smallest farm.
- The \$50,000 payment limitation, if effective, reduced the current benefits of the deficiency payment for very large farms, so its loss reduced average ending farm size less than 2.5%.
- The loss of deficiency payments reduced the average net present value of small farms more than twice as much as for large farms.
- Average ending farm size was reduced more, in percentage terms, for the small farm (-18%) than for the large farm (-2.5%) if deficiency payments were removed.

Target Farm Program Benefits to Small Farms

- The two larger farms were prevented from participating in the Commodity Credit Corporation loan, diversion program, and deficiency payment, in most years, due to their value of production exceeding the maximum of \$300,000.
- The 1,088-acre farm was not affected by the program. However, the rate of growth for the two larger farms was reduced about 50% from the Base.
- Although the two larger farms were unable to place cotton in the Commodity Credit Corporation loan they benefited indirectly from the price stabilizing functions of the loan.

No Farm Program

- Removing all farm program provisions reduced the 1,088-acre farm's chance of remaining solvent for 10 years from 92% to 42%, while the chance of remaining solvent for the 5,570-acre farm declined from 94% to 78%.
- The percentage reduction in average net present value was similarly reduced more for the smallest farm than for the largest farm.
- In the absence of farm programs, all three farms continued to grow but at a much slower rate than under the Base farm program. The largest farm was able to increase its average ending farm size 166 acres over its initial 5,570-acres. Average ending farm size increased

about 124 acres for the smallest farm; however, it survived only 42% of the time.

- The largest farm was forced to sell an average of 441 acres to remain solvent 78% of the time for 10 years.
- Removal of all farm program benefits reduced average ending net worth for all three farms due to reductions in land values.

More Restrictive Federal Income Tax Provisions

- More restrictive federal income tax provisions reduced the average annual rate of growth to a greater extent for the two larger farms than for the 1,088-acre farm.
- Increasing the federal income tax burden on farmers reduced the propensity to grow through purchasing cropland relative to leasing.
- Probability of survival was not significantly affected by a more restrictive set of federal income tax provisions.
- Changes in the tax provisions resulted in reduced annual net farm incomes on all three cotton farms. Reduction in net farm income was greater for the largest farm than for the moderate-size farm.

Financial Bailout Strategies

- Restructuring initial debt for highly leveraged farms failed to appreciably increase the probability of survival for the three Texas cotton farms.
- Debt restructure resulted in accelerated farm growth in later years, which contributed to low probabilities of remaining solvent for 10 years.
- An interest rate buy-down strategy increased the probability of survival only slightly for the two smaller farms while not affecting the largest farm's probability of survival.
- Average ending farm size for an interest buy-down program was only slightly greater than for the Base Financial analysis.
- Neither debt bailout strategy provided much hope for highly leveraged Texas Southern High Plains cotton farmers without substantial off-farm income to subsidize the farm.

Impact of Technology

- Increasing average annual cotton yields had no significant impact on the average growth rate for the three Texas cotton farms. This result was the same for all three farm policies evaluated.
- Farm policies and federal income tax provisions had substantially more impact on the average growth rate for the three Texas cotton farms than yield differences between the most likely technology scenario and the no new technology scenario.

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